CLAIMS

What is claimed is:

1. A method for fabricating a fiber-optic waveguide, comprising the step of spatially selectively removing material from a cladding layer of an evanescent waveguide fiber segment of a waveguide optical fiber and forming an evanescent optical coupling portion of a cladding layer surface thereof, so that a remaining portion of the cladding layer is asymmetrically disposed about at least a portion of a core of the waveguide optical fiber, thereby enabling an evanescent portion of a propagating optical mode propagating therethrough to extend transversely beyond at least a portion of the coupling portion of the cladding layer surface of the evanescent waveguide fiber segment while being substantially transversely encompassed by respective cladding layers of two longitudinally adjacent fiber segments of the waveguide optical fiber.

2. A method for fabricating a fiber-optic waveguide as recited in Claim 1, wherein the cladding-material-removing step comprises spatially-selective etching of material from the cladding layer of the evanescent waveguide fiber segment of the waveguide optical fiber.

3. A method for fabricating a fiber-optic waveguide as recited in Claim 2, wherein the cladding-material-removing step comprises the steps of:
   providing the waveguide optical fiber with a mask that substantially covers the two longitudinally adjacent segments of the waveguide optical fiber but covers only portions of a length and a circumference of the evanescent waveguide fiber segment of the waveguide optical fiber; and
   spatially-selectively etching the waveguide optical fiber, thereby asymmetrically removing material from the cladding layer of the evanescent waveguide fiber segment of the waveguide optical fiber.

4. A method for fabricating a fiber-optic waveguide as recited in Claim 3, wherein the mask-providing step comprises spatially-selective removal of an outer fiber coating from portions of the length and circumference of the evanescent waveguide fiber segment and the mask comprises portions of the outer fiber coating remaining on the two longitudinally adjacent segments of the waveguide optical fiber and on the evanescent waveguide fiber segment.

5. A method for fabricating a fiber-optic waveguide as recited in Claim 4, wherein the mask-providing step comprises spatially-selective laser-machining of the outer fiber coating.

6. A method for fabricating a fiber-optic waveguide as recited in Claim 5, further comprising the step of partially rotating the waveguide optical fiber during laser machining, thereby removing mask material from arcuate portions of a surface of the waveguide optical fiber extending partially around a circumference thereof.

7. A method for fabricating a fiber-optic waveguide as recited in Claim 5, wherein the waveguide optical fiber rotates within a capillary tube during laser machining, thereby providing substantially concentric rotation during laser machining.

8. A method for fabricating a fiber-optic waveguide as recited in Claim 5, further comprising the steps of: rotating the waveguide optical fiber during laser machining, and modulating a laser used for laser machining synchronously with rotation of the waveguide optical fiber, thereby removing mask material from arcuate portions of a surface of the waveguide optical fiber extending partially around a circumference thereof.

9. A method for fabricating a fiber-optic waveguide as recited in Claim 5, wherein the outer fiber coating comprises a polymeric jacket and laser machining is performed with a UV-emitting excimer laser.

10. A method for fabricating a fiber-optic waveguide as recited in Claim 5, wherein the outer fiber coating comprises a carbon coating and laser machining is performed with a pulsed laser.

11. A method for fabricating a fiber-optic waveguide as recited in Claim 5, wherein the outer fiber coating comprises a carbon coating and laser machining is performed with a substantially continuous laser.

12. A method for fabricating a fiber-optic waveguide as recited in Claim 5, wherein the outer fiber coating comprises a photo-resist material.

13. A method for fabricating a fiber-optic waveguide as recited in Claim 3, wherein the mask-providing step comprises spatially-selective deposition of an outer fiber coating on the two longitudinally adjacent segments of the waveguide optical fiber and on portions of the length and circumference of the evanescent waveguide fiber segment, and the mask comprises the outer fiber coating thus deposited.

14. A method for fabricating a fiber-optic waveguide as recited in Claim 13, wherein the mask-providing step comprises spatially-selective metal vapor deposition of the outer fiber coating.

15. A method for fabricating a fiber-optic waveguide as recited in Claim 14, wherein shadow masking techniques are employed to implement the spatially-selective metal vapor deposition of the outer fiber coating.

16. A method for fabricating a fiber-optic waveguide as recited in Claim 3, wherein the spatially-selective etching step is performed using aqueous hydrofluoric acid.

17. A method for fabricating a fiber-optic waveguide as recited in Claim 16, wherein the aqueous hydrofluoric acid comprises between about 5% HF and about 50% HF buffered with NH_4F.

18. A method for fabricating a fiber-optic waveguide as recited in Claim 17, wherein the aqueous hydrofluoric acid comprises between about 7% HF and about 8% HF buffered with between about 30% NH_4F and about 40% NH_4F.

19. A method for fabricating a fiber-optic waveguide as recited in Claim 3, wherein the waveguide optical fiber is polarization-maintaining optical fiber, comprising longitudinally extending stressor elements disposed within the cladding layer in substantially opposing positions about the core, the stressor elements being etched at a slower rate than the cladding layer, thereby yielding transversely protruding passive alignment structures as a result of the cladding-material-removing step.

20. A method for fabricating a fiber-optic waveguide as recited in Claim 19, wherein the passive alignment structures are adapted to engage longitudinally adjacent fiber segments of a fiber-ring whispering-gallery-mode optical resonator, thereby enabling reproducible substantially tangential engagement of the evanescent waveguide fiber segment and a fiber-ring whispering-gallery-mode optical resonator and enabling reproducible evanescent optical coupling between a whispering-gallery optical mode of the fiber-ring resonator and the propagating optical mode of the evanescent waveguide fiber segment.

21. A method for fabricating a fiber-optic waveguide as recited in Claim 3, wherein the cladding-material-removing step further comprises the step of removing the mask from the waveguide optical fiber.

22. A method for fabricating a fiber-optic waveguide as recited in any of Claims 1 through 21, wherein the cladding-material-removing step further comprises the step of controlling a shape and size of the coupling portion of the cladding layer surface of the evanescent waveguide fiber segment.

23. A method for fabricating a fiber-optic waveguide as recited in Claim 22, wherein:
the cladding-material-removing step comprises the steps of
providing the waveguide optical fiber with a mask that substantially covers the two longitudinally adjacent segments of the waveguide optical fiber but covers only portions of a length and a circumference of the evanescent waveguide fiber segment of the waveguide optical fiber, and
spatially-selectively etching the waveguide optical fiber, thereby asymmetrically removing material from the cladding layer of the evanescent waveguide fiber segment of the waveguide optical fiber; and
the optical-coupling-portion-shape-and-size-controlling step comprises controlling a shape and a size of an area of the evanescent waveguide fiber segment left uncovered by the mask-providing step.

24. A method for fabricating a fiber-optic waveguide as recited in Claim 23, wherein a width and a circumferential extent of the area of the evanescent waveguide fiber segment left uncovered by the mask-providing step are controlled, thereby controlling the shape and size of the coupling portion of the cladding layer surface of the evanescent waveguide fiber segment.

25. A method for fabricating a fiber-optic waveguide as recited in Claim 23, wherein:
the area left uncovered by the mask-providing step comprises a plurality of arcuate segments of the cladding layer surface, the arcuate segments extending partially around the circumference of the waveguide optical fiber and being separated from adjacent arcuate segments by intervening portions of the mask; and
number, widths, circumferential extents, and spacings from adjacent arcuate segments are controlled for the plurality of arcuate segments, thereby controlling the shape and size of the coupling portion of the cladding layer surface of the evanescent waveguide fiber segment.

26. A method for fabricating a fiber-optic waveguide as recited in Claim 22, wherein the coupling portion of the cladding layer surface of the evanescent waveguide fiber segment has a saddle-like shape, having a concave longitudinal-sectional shape near at least a portion of the core of the evanescent waveguide fiber segment and a convex transverse-sectional shape near at least a portion of the core of the evanescent waveguide fiber segment.

27. A method for fabricating a fiber-optic waveguide as recited in Claim 26, wherein the concave longitudinal-sectional shape of the coupling portion of the cladding layer surface is adapted to receive and substantially tangentially engage a whispering-gallery-mode optical resonator, and to enable evanescent optical coupling between a whispering-gallery optical mode of the resonator and the propagating optical mode in the evanescent waveguide fiber segment.

28. A method for fabricating a fiber-optic waveguide as recited in Claim 26, wherein the convex transverse-sectional shape of the coupling portion of the cladding layer surface is adapted to enable substantial tangential engagement of the coupling portion of the cladding layer surface and a fiber-ring whispering-gallery-mode optical resonator, and to enable evanescent optical coupling between a whispering-gallery optical mode of the fiber-ring resonator and the propagating optical mode in the evanescent waveguide fiber segment.

29. A method for fabricating a fiber-optic waveguide as recited in Claim 22, wherein the coupling portion of the cladding layer surface of the evanescent waveguide fiber segment has a pit-like shape, having a concave longitudinal-sectional shape near at least a portion of the core of the evanescent waveguide fiber segment and a concave transverse-sectional shape near at least a portion of the core of the evanescent waveguide fiber segment.

30. A method for fabricating a fiber-optic waveguide as recited in Claim 29, wherein the concave longitudinal-sectional shape of the coupling portion of the cladding layer surface is adapted to receive and substantially tangentially engage a whispering-gallery-mode optical resonator, and to enable evanescent optical coupling between a whispering-gallery optical mode of the resonator and the propagating optical mode in the evanescent waveguide fiber segment.

31. A method for fabricating a fiber-optic waveguide as recited in Claim 29, wherein the concave transverse-sectional shape of the coupling portion of the cladding layer surface is

adapted to enable substantial tangential engagement of the coupling portion of the cladding layer surface and a micro-disk whispering-gallery-mode optical resonator, and to enable evanescent optical coupling between a whispering-gallery optical mode of the micro-disk resonator and the propagating optical mode in the evanescent waveguide fiber segment.

32. A method for fabricating a fiber-optic waveguide as recited in Claim 22, wherein the coupling portion of the cladding layer surface of the evanescent waveguide fiber segment has a concave longitudinal-sectional shape near at least a portion of the core of the evanescent waveguide fiber segment and a substantially flat transverse-sectional shape near at least a portion of the core of the evanescent waveguide fiber segment, the concave longitudinal-sectional shape of the coupling portion of the cladding layer surface being adapted to receive and substantially tangentially engage a whispering-gallery-mode optical resonator, and to enable evanescent optical coupling between a whispering-gallery optical mode of the resonator and the propagating optical mode in the evanescent waveguide fiber segment.

33. A method for fabricating a fiber-optic waveguide as recited in Claim 1, wherein the cladding-material-removing step further comprises the step of controlling the amount of cladding material removed from the evanescent wave fiber segment.

34. A method for fabricating a fiber-optic waveguide as recited in Claim 33, wherein the controlling step comprises the steps of:

monitoring optical loss of the waveguide optical fiber during the cladding-material-removing step; and

terminating the cladding-material-removing step in response to the optical loss of the waveguide optical fiber reaching a pre-determined level.

35. A method for fabricating a fiber-optic waveguide as recited in Claim 34, wherein the pre-determined optical loss level is between about 0.1 dB and about 30 dB.

36. A method for fabricating a fiber-optic waveguide as recited in Claim 34, wherein the pre-determined optical loss level is between about 0.1 dB and about 10 dB.

37. A method for fabricating a fiber-optic waveguide as recited in Claim 34, wherein the pre-determined optical loss level is between about 0.1 dB and about 3 dB.

38. A method for fabricating a fiber-optic waveguide as recited in Claim 34, wherein the pre-determined optical loss level is between about 0.1 dB and about 1 dB.

39. A method for fabricating a fiber-optic waveguide as recited in Claim 33, wherein a minimum distance between the core of the waveguide optical fiber and the coupling portion of the cladding layer surface is between about 0 μm and about 10 μm as a result of the cladding-material-removing step.

40. A method for fabricating a fiber-optic waveguide as recited in Claim 33, wherein the core of the waveguide optical fiber is partially exposed as a result of the cladding-material-removing step.

41. A fiber-optic waveguide fabricated by the method of any of Claims 1 through 40.

42. A fiber-optic waveguide, comprising:

an evanescent waveguide fiber segment comprising a core and a cladding layer;

a first longitudinally adjacent fiber segment comprising a core and a cladding layer, the cladding layer substantially surrounding the core and substantially transversely encompassing a propagating optical mode propagating through the first adjacent fiber segment; and

a second longitudinally adjacent fiber segment comprising a core and a cladding layer, the cladding layer substantially surrounding the core and substantially transversely encompassing a propagating optical mode propagating through the second adjacent fiber segment,

wherein:

the first adjacent fiber segment is joined at an end thereof to a first end of the evanescent waveguide fiber segment and the second adjacent fiber segment is joined at an end thereof to a second end of the evanescent waveguide fiber segment;

the core of the first adjacent fiber segment, the core of the evanescent waveguide fiber segment, and the core of the second adjacent fiber segment form a substantially continuous core of the fiber-optic waveguide, thereby enabling a propagating optical mode to propagate therethrough; and

the cladding layer of the evanescent waveguide fiber segment is asymmetrically disposed about at least a portion of the core thereof, thereby yielding a coupling portion of a cladding layer surface of the evanescent waveguide fiber segment and enabling an

evanescent portion of the propagating optical mode to extend transversely beyond at least a portion of the coupling portion of the cladding layer surface of the evanescent waveguide fiber segment.

43. A fiber-optic waveguide as recited in Claim 42, wherein the coupling portion of the cladding layer surface of the evanescent waveguide fiber segment has a saddle-like shape, having a concave longitudinal-sectional shape near at least a portion of the core of the evanescent waveguide fiber segment and a convex transverse-sectional shape near at least a portion of the core of the evanescent waveguide fiber segment.

44. A fiber-optic waveguide as recited in Claim 43, wherein the concave longitudinal-sectional shape of the coupling portion of the cladding layer surface is adapted to receive and substantially tangentially engage a whispering-gallery-mode optical resonator, and to enable evanescent optical coupling between a whispering-gallery optical mode of the resonator and the propagating optical mode in the evanescent waveguide fiber segment.

45. A fiber-optic waveguide as recited in Claim 43, wherein the convex transverse-sectional shape of the coupling portion of the cladding layer surface is adapted to enable substantial tangential engagement of the coupling portion of the cladding layer surface and a fiber-ring whispering-gallery-mode optical resonator, and to enable evanescent optical coupling between a whispering-gallery optical mode of the fiber-ring resonator and the propagating optical mode in the evanescent waveguide fiber segment.

46. A fiber-optic waveguide as recited in Claim 42, wherein the coupling portion of the cladding layer surface of the evanescent waveguide fiber segment has a pit-like shape, having a concave longitudinal-sectional shape near at least a portion of the core of the evanescent waveguide fiber segment and a concave transverse-sectional shape near at least a portion of the core of the evanescent waveguide fiber segment.

47. A fiber-optic waveguide as recited in Claim 46, wherein the concave longitudinal-sectional shape of the coupling portion of the cladding layer surface is adapted to receive and substantially tangentially engage a whispering-gallery-mode optical resonator, and to enable evanescent optical coupling between a whispering-gallery optical mode of the resonator and the propagating optical mode in the evanescent waveguide fiber segment.

48. A fiber-optic waveguide as recited in Claim 46, wherein the concave transverse-sectional shape of the coupling portion of the cladding layer surface is adapted to enable substantial tangential engagement of the coupling portion of the cladding layer surface and a micro-disk whispering-gallery-mode optical resonator, and to enable evanescent optical coupling between a whispering-gallery optical mode of the micro-disk resonator and the propagating optical mode in the evanescent waveguide fiber segment.

49. A fiber-optic waveguide as recited in Claim 42, wherein the coupling portion of the cladding layer surface of the evanescent waveguide fiber segment has a concave longitudinal-sectional shape near at least a portion of the core of the evanescent waveguide fiber segment and a substantially flat transverse-sectional shape near at least a portion of the core of the evanescent waveguide fiber segment, the concave longitudinal-sectional shape of the coupling portion of the cladding layer surface being adapted to receive and substantially tangentially engage a whispering-gallery-mode optical resonator, and to enable evanescent optical coupling between a whispering-gallery optical mode of the resonator and the propagating optical mode in the evanescent waveguide fiber segment.

50. A fiber-optic waveguide as recited in Claim 42, wherein a thickness of the cladding layer between the coupling portion of the cladding layer surface and the core of the evanescent waveguide fiber segment yields a pre-determined level of optical loss of the evanescent waveguide fiber segment.

51. A fiber-optic waveguide as recited in Claim 50, wherein the pre-determined optical loss level is between about 0.1 dB and about 30 dB.

52. A fiber-optic waveguide as recited in Claim 50, wherein the pre-determined optical loss level is between about 0.1 dB and about 10 dB.

53. A fiber-optic waveguide as recited in Claim 50, wherein the pre-determined optical loss level is between about 0.1 dB and about 3 dB.

54. A fiber-optic waveguide as recited in Claim 50, wherein the pre-determined optical loss level is between about 0.1 dB and about 1 dB.

55. A fiber-optic waveguide as recited in Claim 42, wherein a minimum distance between the core of the evanescent waveguide fiber segment and the coupling portion of the cladding layer surface is between about 0 μm and about 10 μm.

56. A fiber-optic waveguide as recited in Claim 55, wherein the core of the evanescent waveguide fiber segment is partially exposed.

57. A fiber-optic waveguide as recited in Claim 42, wherein the adjacent fiber segments and evanescent waveguide fiber segment are fabricated from polarization-maintaining optical fiber, and each of said segments further comprises longitudinally extending stressor elements disposed within the respective cladding layer in substantially opposing positions about the respective core, the stressor elements of the evanescent waveguide segment serving as transversely protruding passive alignment structures.

58. A fiber-optic waveguide as recited in Claim 57, wherein the passive alignment structures are adapted to engage longitudinally adjacent fiber segments of a fiber-ring whispering-gallery-mode optical resonator, thereby enabling reproducible substantially tangential engagement of the evanescent waveguide fiber segment and a fiber-ring whispering-gallery-mode optical resonator and enabling reproducible evanescent optical coupling between a whispering-gallery optical mode of the fiber-ring resonator and the propagating optical mode of the evanescent waveguide fiber segment.

59. A method for fabricating a resonant optical power control device incorporating a fiber-optic waveguide fabricated by the method of any of Claims 1 though 40 or recited in any of Claims 41 though 58, comprising the steps of:

positioning and securing the fiber-optic waveguide within a waveguide-alignment groove of an alignment device; and

positioning and securing a whispering-gallery-mode optical resonator within a resonator-alignment groove of the alignment device,

wherein:

the whispering-gallery-mode optical resonator is provided with an alignment member for accurately positioning the resonator in the resonator-alignment groove;

the alignment device comprises a first alignment substrate, and the waveguide-alignment groove and the resonator-alignment groove are provided on a first surface of the first alignment substrate; and

the waveguide-alignment groove and the resonator-alignment groove of the alignment device position the whispering-gallery-mode optical resonator in substantial tangential engagement with the coupling portion of the cladding layer surface of the evanescent

waveguide fiber segment of the fiber-optic waveguide, thereby evanescently optically coupling the resonator fiber segment and the fiber-optic waveguide.

60. A method for fabricating a resonant optical power control device as recited in Claim 59, wherein the whispering-gallery-mode optical resonator comprises a fiber-ring of an optical fiber, the fiber ring having a spatial differential of a physical property of the optical fiber between a resonator segment of the optical fiber and longitudinally adjacent segments of the optical fiber, thereby enabling substantial confinement by the resonator fiber segment of a substantially resonant whispering-gallery optical mode propagating around the circumference of the fiber at least partially within the resonator fiber segment, and at least one of the adjacent fiber segments serves as the resonator alignment member.

61. A method for fabricating a resonant optical power control device as recited in Claim 59, wherein the whispering-gallery-mode optical resonator comprises a micro-sphere connected to a tapered portion of a resonator optical fiber, the resonator optical fiber substantially coinciding with a symmetry axis of the micro-sphere and serving as the resonator alignment member.

62. A method for fabricating a resonant optical power control device as recited in Claim 59, wherein the resonator-alignment groove and the waveguide-alignment groove are substantially perpendicular, and differ in depth so that the coupling portion of the cladding layer surface of the evanescent waveguide fiber segment of fiber-optic waveguide is in contact with the circumference of the whispering-gallery-mode optical resonator when the fiber-optic waveguide and resonator alignment member are positioned within the waveguide-alignment groove and the resonator-alignment groove, respectively.

63. A method for fabricating a resonant optical power control device as recited in Claim 59, further comprising the step of sealing the alignment device, thereby isolating the fiber-optic waveguide and the whispering-gallery-mode resonator from a use environment.

64. A method for fabricating a resonant optical power control device as recited in Claim 59, wherein the resonator alignment member is provided with an alignment structure and the resonator-alignment groove is provided with a corresponding alignment structure, thereby enabling reproducible optical coupling of the whispering-gallery-mode optical resonator and the coupling portion of the cladding layer surface of the evanescent waveguide fiber segment of fiber-optic waveguide when the resonator alignment member and the corresponding alignment structure of the resonator-alignment groove are engaged.

65. A method for fabricating a resonant optical power control device as recited in Claim 64, wherein the resonator alignment member comprises a substantially annular circumferential flange, and the corresponding alignment structure of the resonator-alignment groove comprises a transverse groove for receiving the flange.

66. A method for fabricating a resonant optical power control device as recited in Claim 64, wherein the corresponding alignment structure of the resonator-alignment groove comprises an inwardly-protruding transverse flange, and the resonator alignment member comprises a substantially circumferential groove for receiving the flange.

67. A method for fabricating a resonant optical power control device as recited in Claim 59, further comprising the steps of positioning and securing a second optical waveguide within a second waveguide alignment groove of the alignment device, wherein the second waveguide-alignment groove and the resonator-alignment groove of the alignment device position the resonator fiber segment in substantial tangential engagement with the second optical waveguide, thereby evanescently optically coupling the whispering-gallery-mode resonator and the second optical waveguide and enabling routing of optical power of the propagating optical mode from the fiber-optic waveguide into the second optical waveguide.

68. A method of fabricating a resonant optical power control device as recited in Claim 67, wherein the second optical waveguide comprises a second fiber-optic waveguide fabricated by the method of any of Claims 1 through 40 or recited in any of Claims 41 through 58.

69. A method for fabricating a resonant optical power control device as recited in Claim 59, wherein the whispering-gallery-mode resonator is provided with a modulator for controlling optical properties of the whispering-gallery-mode resonator, and the alignment device is provided with a modulator control element.

70. A method for fabricating a resonant optical power control device as recited in Claim 69, wherein the modulator control element enables application of an electronic signal to the modulator for controlled modulation of the optical properties of the whispering-gallery-mode resonator.

71. A method for fabricating a resonant optical power control device as recited in Claim 69, wherein the modulator control element enables application of an optical signal to the modulator for controlled modulation of the optical properties of the whispering-gallery-mode resonator.

72. A method for fabricating a resonant optical power control device as recited in Claim 69, further comprising the step of sealing the alignment device, thereby isolating the fiber-optic waveguide, resonator fiber segment, and modulator from a use environment.

73. A method for fabricating a resonant optical power control device as recited in Claim 69, further comprising the step of positioning a secondary optical assembly on the alignment device in substantial tangential engagement with the whispering-gallery-mode resonator, thereby optically coupling the resonator and the secondary optical assembly and enabling controlled modulation of optical coupling of the whispering-gallery-mode resonator and the secondary optical assembly through the controlled modulation of the optical properties of the whispering-gallery-mode resonator.

74. A method for fabricating a resonant optical power control device as recited in Claim 73, wherein the secondary optical assembly comprises second fiber-optic waveguide.

75. A method for fabricating a resonant optical power control device as recited in Claim 73, wherein the secondary optical assembly comprises a second whispering-gallery-mode optical resonator.

76. A method for fabricating a resonant optical power control device as recited in Claim 73, further comprising the step of sealing the alignment device, thereby isolating the fiber-optic waveguide, resonator fiber segment, modulator, and secondary optical assembly from a use environment.

77. A method for fabricating a resonant optical power control device as recited in Claim 59, further comprising the steps of positioning and securing a modulator optical assembly on the alignment device in substantial tangential engagement with the whispering-gallery-mode resonator, thereby evanescently optically coupling the resonator and the modulator optical assembly and enabling controlled modulation of optical coupling of the resonator and the modulator optical assembly through the controlled modulation of the optical properties of the modulator optical assembly.

78. A method for fabricating a resonant optical power control device as recited in Claim 77, wherein the alignment device comprises a second alignment substrate having the modulator optical assembly secured thereto and adapted to enable reproducible optical coupling of the whispering-gallery-mode resonator and the modulator optical assembly.

79. A method for fabricating a resonant optical power control device as recited in Claim 78, further comprising sealing the second alignment substrate onto the first alignment substrate,

thereby isolating the fiber-optic waveguide, whispering-gallery-mode resonator, and modulator optical assembly from a use environment.

80. A method for fabricating a resonant optical power control device as recited in Claim 77, wherein the alignment device is provided with a modulator control element for controlled modulation of the optical properties of the modulator optical assembly.

81. A method for fabricating a resonant optical power control device as recited in Claim 80, wherein the modulator control element enables application of an electronic signal to the modulator optical assembly for controlled modulation of the optical properties of the modulator optical assembly.

82. A method for fabricating a resonant optical power control device as recited in Claim 80, wherein the modulator control element enables application of an optical signal to the modulator optical assembly for controlled modulation of the optical properties of the modulator optical assembly.

83. A method for fabricating a resonant optical power control device as recited in Claim 77, wherein the modulator optical assembly comprises an optical loss modulator.

84. A method for fabricating a resonant optical power control device as recited in Claim 77, wherein the modulator optical assembly comprises a non-linear optical device.

85. A method for fabricating a resonant optical power control device as recited in Claim 77, wherein the modulator optical assembly comprises an electro-optic device.

86. A method for fabricating a resonant optical power control device as recited in Claim 77, wherein the modulator optical assembly comprises an electro-absorptive device.

87. A method for fabricating a resonant optical power control device as recited in Claim 77, wherein the modulator optical assembly comprises a semiconductor device.

88. A method for fabricating a resonant optical power control device as recited in Claim 77, wherein the modulator optical assembly comprises a second whispering-gallery-mode optical resonator.

89. A method for fabricating a resonant optical power control device as recited in Claim 77, wherein the modulator optical assembly comprises a second fiber-optic waveguide.

90. A resonant optical power control device fabricated according to the method of any of Claims 59 through 89.

91. A resonant optical power control device, comprising:

an alignment device comprising a first alignment substrate having a waveguide-alignment groove and a resonator-alignment groove on a first surface thereof;

a fiber-optic waveguide, fabricated by the method of any of Claims I though IB3 or recited in any of Claims II though IIIF1, secured within the waveguide-alignment groove;

a whispering-gallery-mode optical resonator secured within the resonator-alignment groove,

wherein the waveguide-alignment groove and the resonator-alignment groove of the alignment device position the resonator fiber segment in substantial tangential engagement with the coupling portion of the cladding layer surface of the evanescent waveguide fiber segment of the fiber-optic waveguide, thereby evanescently optically coupling the resonator fiber segment and the fiber-optic waveguide.

92. A resonant optical power control device as recited in Claim 91, further incorporating the limitations of any of Claims 59 through 89.